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eventual systems would have the name of the depositing participating organization automatically as deposits are processed. Image processing, he told the BAI conference, would be useful in retrieving checks upon customer request. Capabilities of today's document retrieval systems must be enhanced if truncation to be accepted fully by the public, M White added.

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Washington has become the first state in the U.S. to deliver a program over the Internet that automatically computes taxes and enables businesses to file and pay their returns electronically. And it's all thanks to the teamwork of the Washington State Department of Revenue (DOR), the Department of Information Services (DIS) and Washington businesses. Governor Gary Locke highlighted the electronic tax filing initiative during a December 1997 press conference as he delivered a year-end report on his efforts to improve the quality and efficiency of state government. "The ability to file and pay taxes via the Internet is a national first, and it's not just the use of technology that's innovative," said Locke. "This project was developed not by our state government alone, but by a partnership of government and our customers."

Electronic System Benefits Taxpayers and the State

The goal of the Electronic Tax Filing (ELF) system is to enhance customer service by offering a timesaving method for businesses to file taxes and by helping them fill out their tax returns correctly the first time. This means reducing the 15 to 20 percent error rate now found in paper tax returns. Since the new system will not accept tax returns that include mistakes, it will save the DOR and the taxpayer the time-consuming and costly rework of returns and will reduce the printing and postage costs that approach \$4200 annually for every 1000 monthly taxpayers. ELF will automatically help ensure that tax revenues are distributed to the right local government

the first time. In addition, ELF will improve "front counter" support, allowing DOR employees to apply their efforts to higher level tasks. A DOR strategic plan identified electronic tax filing as a way to more efficiently gather and input taxpayer information. Electronic filing was an exciting possibility for the DOR, but it also presented great risks and many unknowns. Several looming questions had to be answered:

? Is the business community ready to conduct financial transactions with government over the Internet?

? Since this combination of enabling technologies is unproven, is this system ready for general use?

? Can the components be integrated to provide a transactional system with adequate security?

? Can electronic payments be safely processed from a web application?

? What are the impacting legal and policy issues?

The DOR and DIS created a phased project approach to answer the most pivotal questions first. This way feasibility could be assessed while controlling expense and risk. Project phases were:

? Phase one Will taxpayers use it?

? Phase two Can it be built?

It was resolved that, if phases one and two provided favorable results, phase three would be implemented to build the production system.

The ELF system was developed by a partnership of government and its customers.

Phase One Will Taxpayers Use It?

To determine whether taxpayers would use an electronic tax filing system, the DOR and DIS conducted one-on-one meetings and focus groups with businesses. The participating businesses advised that they would use the system if it cost less than a 32-cent stamp and took less than 10 minutes to complete. They specified that the system's performance should be comparable to spreadsheets running on their own PCs.. They also provided the DOR with 'a list of desired system features. For example:

\*Automate math calculations.

\*Integrate the tax form and payment into one system so the tax payer can submit them simultaneously.

\*Provide access to tax rules and interpretations that already exist on the DOR's Internet home page from the tax filing application.

\*Allow taxpayers to print a paper copy of the tax return for their records.

\*Create an electronic error check process Co ensure tax returns are error-free prior to submission and payment.

\*Create a confirmation receipt that is sent from the DOR to the taxpayer after the data and payment is received by the DOR.

Together; the DOR and DIS created a visionary prototype and took it back to the businesses. Pleased that government had listened, the taxpayers recognized the specific features they had requested and acknowledged the system's value to their businesses.

Value to the Taxpayer

Creating a prototype was merely the first step. The DOR and DIS then had to assess the ELF'S real value to the taxpayers, taking into consideration a number of their conditions for acceptance, such as:

\*If you can help me get it right the first time, everyone gains.

\*If this will help me interpret tax rules accurately, I will use it.

\*If it makes tax reporting faster and more convenient, I will use it.

\*If I don't have to fish through piles of mail to find my return, I will be happy.

The prototype was also shown to the DOR staff. They Liked the concept and gave important suggestions for improving it further. In this way, agency staff invested in the project and took ownership of the system.

"Will taxpayers use it? " was answered with a resounding "yes!" at the close of phase one. In addition, the project drew buy-in and support from taxpayers as well as from agency staff and executives. In fact, several

businesses volunteered to be "proof of concept" electronic tax filers. Several businesses changed from quarterly to monthly tax filing and agreed to pay by electronic funds transfer (RET) to participate in the rest. Phase one was completed in five months. Functional requirements for an electronic tax filing system had been defined which provided real benefits and value to business and government.

#### Phase Two Can It be Built?

Before accurate estimates for a project can be developed, the functional requirements and the architecture must be defined. With the functional requirements defined in phase one, the team set out in phase two to define a working architecture and evaluate it with live tax filing.

Over the six-month development period, the project team encountered and resolved many architectural and development barriers. They developed a three-tiered computing platform; deployed business tax rules to execute on the taxpayer's workstation; and established an encrypted, secure session through the DIS' firewall and security server. As a result, the team determined that Internet technology would support an online tax filing service. Nine businesses successfully filed and paid their tax returns over the Internet in November and December 1997, proving the technology architecture and confirming taxpayer acceptance.

The ELF system features a simple interface, automatic computations and error checking, a secure, encrypted environment, and up-to-date online help. To eliminate math and copying errors, the program is designed to automatically perform all required tax return calculations. The system won't accept a tax return if there are errors all features the business community requested. In addition, taxpayers don't have to key in their name, address or other related information it automatically appears on a customized form that reflects the businesses' reporting profile.

#### Developing Technology

##### Architecture and Components

The DIS put a system of firewalls into place to protect government networks from open access through the Internet. The system authenticates a taxpayer, allows a closely controlled connection through the firewalls to remain open between ELF and the taxpayer, and encrypts the entire session end to end. The ELF system provides immediate, safe and secure encryption and transfer of data and payments. A summary view of the design is shown in Figure 1. (image omitted)

The system facilitates electronic payments using electronic funds transfer Automated Clearing House (**ACH**) debit which are initiated from ELF. To promote confidentiality of sensitive information, taxpayer bank account numbers reside with the originating bank and are never in the state's possession. The team continues to look at other electronic payment methods, as they become available.

The phase two architecture included three tiers:

- ? Client services (to provide the user interface) using Internet Explorer 3.02

- ? Business services using NT 4.0, MTS v1.1, IIS 3.0

- ? Data services using MS SQL Server 6.5 The DOR/DIS team used Visual Studio '97 Enterprise as a development tool. They wrote classes, objects and components in Visual Basic 5.0. The proof of concept application ran on two desktop Compaq 133s. One, with 64MB of RAM, supported the database management system. The other, with 128MB RAM, acted as the application server with Internet Information Server (ITS) and Microsoft Transaction Server (MTS).

The application used the Active Document function in Internet Explorer to deploy tax form Logic to the taxpayer's workstation. Communications for the process were established using Remote Data Services 1.5 and Active Data Objects was employed for open database connectivity to relational data sources. They facilitated electronic payments using electronic funds transfer (**ACH** debit), authenticated the user, and secured the process using SSL 3.0 (secure socket layer) to provide communication channels as well as encryption of the transaction data content.

While constructing the tax filing system, the team also identified how an actual production system would impact the DOR's existing systems and processes which presented opportunities for process improvement. TM DOR identified specific systems that must be upgraded or interfaced with the application to support an electronic tax filing application.

For example, the payment pulling process the DOR currently uses for electronic funds transfer (EFT) filers lacks the capacity to handle a large influx of new BET filers and must be upgraded. The team must develop an interface to the DOR's excise tax system; build an automated registration system to add thousands of businesses per month to the electronic tax filing system; and implement a technical help desk to assist taxpayers who encounter technical problems. The DOR can only deploy ELF as fast as capacity grows for each supporting system.

As a result of phase two, the team concluded that a transactional system could be built to securely support electronic tax filing and payments over the Internet. The governor featured this project as an excellent example of effective partnership between business and government to improve the quality of government services. Based on the success of phase two, the DOR decided to implement phase three and develop a production version of the electronic tax filing system.

#### Phase Three Build It

The team is now at work on phase three, building an electronic filing system that will work on a larger scale. The DOR scheduled implementation of the production system in August 1998 and is adding increasing numbers of businesses each month. The department expects several thousand electronic tax filers by June 1999 and expects more than 60,000 businesses to file electronically by June 2003.

To improve the three-tier production architecture over the phase two proof of concept, developers plan to move more processing up to the business services tier from the client services tier. This will reduce installation complexity and increase usability and reliability. Instead of installing code on the tax filer's PC through active documents, the team will send a web page with imbedded logic through Dynamic HTML. The system will rely heavily on the combined use of Internet Explorer 4.01, Dynamic HTML, JScript and Active Server Pages.

The system software will include Windows NT 4.0 Server Enterprise Edition, including LIS, MIS and clustering capacity. SQL Server 6.5 Enterprise Edition is the data base management system and SQL Server Internet Connection License is used to ensure unlimited connectivity to all tax filers.

The production hardware platform will use high-end Compaq Proliant file servers with two Pentium Pro processors, 512MB RAM and 30GB of storage. There will be two servers supporting the ELF system and two supporting the DBMS functions. These servers will operate in a clustered environment to ensure scalability and fault tolerance. An overview of the system is shown in Figure 2. (image omitted)

Dynamic HTML used with this architecture enables central code management and deployment, provides the taxpayer with rapid response time through local program execution, minimizes network traffic and accommodates changing tax laws.

#### Lessons Learned

Ultimately, the team concluded that ELF should be deployed to taxpayers only as fast as capacity grows for related computer systems and customer support. ELF will support more than 60,000 taxpayers far more than any user base in state government. The DOR must find a way to support this very large user base in a cost-effective manner.

Organizations should not be lulled into thinking that systems with short schedules and small budgets have a correspondingly minimal impact on them. To the contrary, web-based service delivery systems can be developed with shorter time frames and smaller budgets, yet they dramatically impact processes and policies throughout any organization. The team found that ownership and buy-in from the business community

and internal staff, along with executive support, are essential to project success. Without these, one party or the other will become disinterested and the system will founder or go unused. Electronic service delivery systems will be successful to the degree that they provide business value to the customer and the service provider.

The ELF system is a groundbreaking initiative that overcame many challenges at once. The DOR/DIS team built a true transactional system for the Web that is reliable and responsive. They addressed Internet security and confidentiality concerns by developing and proving solutions. The team initiated and processed secure electronic payments from a Web application. Most important, taxpayers found business value in the system and agreed to conduct mission-critical business with government electronically.

As a result of this mutually beneficial partnership, the DOR is providing better tax service to the business community while reducing its cost. The DIS is providing advanced infrastructure for security and electronic payment technology. And, finally, Washington state agencies are improving government services.

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<http://www.wa.gov/DIS/TechCentral>.

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